FOREST PEST MANAGEMENT
Pacific Southwest Region

36,04082 -118.53878

Report No. C95-9

3420
October 31, 1995

AN EVALUATION OF DWARF MISTLETOE CONDITIONS AT THREE RECREATION SITES ON THE SEQUOIA NATIONAL FOREST

John Pronos
Plant Pathologist

ABSTRACT

The distribution and severity of western dwarf mistletoe was assessed at Long Meadow and Lower Peppermint Campgrounds on the Hot Springs Ranger District and at the Jerky Trailhead on the Tule River Ranger District. In each area, dwarf mistletoe suppression is warranted and would help to improve overall tree health. Delaying treatment will only allow infection levels to increase and require more drastic control measures in the future.

INTRODUCTION

The Sequoia National Forest is proposing to suppress dwarf mistletoe at three recreation sites in FY 96. This pest evaluation was intended to (1) determine if suppression activities are justified, (2) determine if it is appropriate to request Forest Pest Manangement (FPM) funding, and (3) provide treatment options/guidelines. The sites were visited on October 25, 1995, by George Powell from the Hot Springs RD and John Pronos from the FPM South Sierra Shared Service Area office in Sonora, CA.

Long-term objectives for the manangement of recreation site vegetation is contained in the Sequoia National Forest Land Management Plan, plus existing silvicultural prescriptions outline treatments required to attain the desired condition. In general, the objectives for these sites is to reduce hazards, improve tree health and vigor, and to maintain aesthetic values.

OBSERVATIONS/DISCUSSION

Tree cover at each recreation site is primarily Jeffrey and/or ponderosa pine with differing components of incense-cedar, California black oak, white fir, and sugar pine. Past management activties were limited to hazard tree removal.

Long Meadow Campground is on the Hot Springs RD and occupies about 20 acres at an elevation of 6000 feet. The area has a high proportion of incense-cedar in both the overstory and understory. Many areas in this campground are densely stocked (site class is Dunning II). There is very little Jeffrey pine regeneration.

Lower Peppermint Campground is also on the Hot Springs RD, covering 20 acres at an elevation of 5500. Site class is Dunning III. The multi-storied stand here is mostly Jeffrey and ponderosa pine. Much of this site is densely stocked. A small opening was recently created when several dozen dead pines were removed over a 2-3 year period. Bark beetles were the likely culprits here, responding to tree stress created by overstocked conditions. Incense-cedar is a minor component and occurs mainly in the understory.

Jerky Trailhead is a 10-acre site on the Tule River RD at 6000 feet elevation. It has the sparest component of pine with scattered overstory trees. Mortality of overstory pines has been common here in the recent past and is continuing. Pine, black oak and incense-cedar are common in the understory. Site class is Dunning III.

Dwarf Mistletoe

Western dwarf mistletoe (Arceuthobium campylopodum) is the primary pest affecting ponderosa and Jeffrey pines at all three sites. In each case, the dwarf mistletoe is characteristically irregular in its distribution and severity. Where mistletoe is present, infections are moderate to severe using the Hawksworth 6-class rating system. All sites had mistletoe in the overstory pine, and where there was understory pine, mistletoe was established there also.

Heavy dwarf mistletoe infection has undoubtedly contributed to past pine mortality at these locations. Stands do not naturally outgrow infestations when mistletoe is well established in the overstory and understory. Not treating these areas will allow the gradual deterioration and loss of pines. The proper treatment, however, can help to reduce the amount of mistletoe, extend tree longevity, and increase tree health. In most cases branch pruning and tree removal would provide adequate suppression at these three sites. Broom pruning may be the best alternative where there is no pine regeneration and overstory infection is high. This treatment would allow the retention of large trees that otherwise should be removed. During the site visit, the importance of establishing buffer zones was discussed to prevent or slow down the re-introduction of dwarf mistletoe.

The following attachments are included at the end of this report: Attachment #1 describes the biology of western dwarf mistletoe and will help explain how the parasite spreads and affects its host. This biology lays the foundation for understanding how to control dwarf mistletoe. Attachment #2 explains why and how we control this pest and provides guidelines for submitting requests for FPM funding. FPM will work with District personnel to meet project proposal requirements. Attachment #3 is the form needed for all suppression projects. One note relating to this form is that WO direction does NOT allow suppression funding to be assessed for overhead or GA.

ATTACHMENT #1

Biology Of Western Dwarf Mistletoe

Western Dwarf Mistletoe

Dwarf mistletoes (Arceuthobium spp.) are parasitic, flowering plants that can only survive on living conifers in the Pinaceae. They obtain most of their nutrients and all of their water and minerals from their hosts. Western dwarf mistletoe (A. campylopodum) infects principally ponderosa, Jeffrey, and knobcone pines, and occasionally Coulter and lodgepole pines.

Dwarf mistletoes spread by means of seed. In the fall the fruit ripen and fall from the aerial shoots. The seeds are forcibly discharged. The seed is covered with a sticky substance and adheres to whatever it contacts. When a seed lands in a host tree crown, it usually sticks to a needle or twig, where it remains throughout the winter. The following spring the seed germinates and penetrates the twig at the base of the needle. For the next 2-4 years, the parasite grows within the host tissues, developing a root-like system within the inner bark and outer sapwood, and causing the twig or branch to swell. Aerial shoots then develop and bear seed in another 2-4 years.

Dispersal of dwarf mistletoe seeds is limited to the distance the seeds travel after being discharged. From overstory to understory, this is usually 20 to 60 feet, but wind may carry them as far as 100 feet from the source. A rule of thumb is that the seeds can travel a horizontal distance equal to the height of the highest plant in an infected tree. There is some evidence that long distance spread of dwarf mistletoe is occasionally vectored by birds and animals.

Vertical spread within tree crowns of most dwarf mistletoes is limited to less than one foot per year because of foliage density. Because of the thin crowns of Digger pine, however, the vertical rate of spread has been measured as being greater than 2 feet per year. This rate of spread equalled or exceeded the rate of height growth of infected trees.

Dwarf mistletoes are easy to identify because they are generally exposed to view within a tree's crown. Signs of infection include the yellow-green to orange mistletoe plants, basal cups on a branch or stem where the plants were attached, and detached plants on the ground beneath an infected tree. Symptoms include spindle-shaped branch swellings, witches' brooms in the lower crown, and bole swellings.

ATTACHMENT #2

GUIDELINES FOR THE USE OF FPM FUNDING FOR SUPPRESSION OF WESTERN DWARF MISTLETOE IN CALIFORNIA RECREATION AREAS

USFS Pacific Southwest Region, Forest Pest Management
Revised October, 1995

WHY TREAT DWARF MISTLETOE-INFESTED STANDS?

The progressive effects of dwarf mistletoe on trees are not dramatic nor immediately obvious to the casual observer, but take place over a long period of time. Field observations and studies involving ponderosa and Jeffrey pines in California, Nevada, and Arizona recreation areas have produced several generalizations to help estimate the future effects of dwarf mistletoe on individual trees. Left untreated, dwarf mistletoe will continue to intensify in already infected trees. One might expect about 50% of pines with a Hawksworth Dwarf Mistletoe Rating (DMR) of 5 or 6 to be dead after 15-20 years. Trees rated 1 through 4 might be expected to increase to the next highest DMR in 10 years. Such trees might not be expected to die because of dwarf mistletoe alone. However, drought or other stresses often further weaken mistletoe-infected trees, leading to bark beetle attack and subsequent mortality. Thus, campgrounds infested with dwarf mistletoe often require the costly removal of dead, dying, and hazardous trees, resulting in campgrounds which are denuded and less desirable to visitors.

Natural regeneration is often absent or stunted in campgrounds, and planting is expensive. Therefore, prolonging the lives of mature trees and ensuring the longevity of young pines becomes a necessity if a campground is to be maintained. If the recreation manager wishes to prolong the lives of dwarf mistletoe-infected pines, he must treat the stands to reduce the impact of the parasite. Failure to treat the stand will lead to intensification of the problem and further stand degeneration.

OBTAINING FUNDING TO IMPLEMENT A DWARF MISTLETOE SUPPRESSION PROGRAM

Funding to implement all steps of a dwarf mistletoe suppression program is available from the Regional Office through Forest Pest Management. These steps include (1) a biological evaluation of the campground, (2) a pre-suppression survey of the infested areas to determine the extent of the infestation and which treatment or combination of treatments will be implemented, (3) the actual treatment, (4) a post-suppression evaluation, and (5) reentry to treat residual infections, if needed. The FPM staff can assist with the biological evaluation, pre-suppression survey, and post-treatment evaluation, at the request of the Forest or District.

Forest Pest Management expects to have dwarf mistletoe suppression funds for the current and future fiscal years. FPM funds may be used for the pre-suppression survey and for any direct suppression efforts, i.e. pruning and

tree removal. FPM funds cannot be used for associated thinning of uninfected trees, planting, hazard tree removal, or other silvicultural practices. If the Forest/District decides to request suppression dollars, the following must be submitted to FPM for approval:

1. a project proposal, Form FS-3400-2, and
2. an environmental assessment that includes project objectives, a biological evaluation, a project work plan, an analysis of economic efficiency (FSM 1970 and 3422), and a post-suppression evaluation plan.

At your request, the FPM staff is available to provide whatever assistance or additional information it can for satisfying these requirements.

SUPPRESSION TREATMENTS

A number of treatment methods are available for the suppression of dwarf mistletoe in recreation areas. They can be used singly or in combination. The method or methods chosen for a particular site depends heavily upon the management goals for that site. Stand structure and composition and the intensity of the infection should also be considered. Below is a list of alternative treatments which FPM can recommend, and guidelines for their implementation. The direct methods are those which can be funded with FPM suppression funds. In keeping with the theme of integrated pest management, these treatments are designed to promote overall stand vigor by suppressing dwarf mistletoe impact.

We suggest that prior to beginning any preparation of a project proposal, our staff should meet with Forest/District personnel to go over actual dwarf mistletoe field situations and appropriate treatment strategies. The attached Dwarf Mistletoe Survey Data Sheet may be used to help determine individual tree treatments and to estimate project costs. This document can also help evaluate treatment effectiveness and thoroughness during the required post-evaluation stage of the project.

Direct Suppression Methods

1. Broom Pruning

Objective: To extend tree life and maintain individual treated trees on a site as long as possible.

Guidelines: Remove dwarf mistletoe witches' brooms from high-value trees only if they will have at least 30% live crown after removal of the brooms. This treatment will not eliminate mistletoe from the stand, nor will it prevent future spread. It is most often used in areas that have little or no understory.

2. Tree Removal

Objective: To remove trees expected to die within ten to fifteen years, to prevent the build-up of bark beetles, and to reduce dwarf mistletoe seed in the stand.

Guidelines: Remove trees with a DMR of 5 or 6, or a rating of 4 with mistletoe in the upper one-third of the crown. Such trees generally are not prunable, pose a threat to adjacent uninfected pines, and have a higher probability of dying within 10 to 15 years or during the next drought. It is also advisable to remove infected pines that will have less than 30 percent live crown after pruning, or are growing in dense aggregations where removal of selected individuals would benefit neighboring uninfected or slightly infected pines. Remove all trees having bole infections at a point less than six inches in diameter. Bole infections are not serious from the standpoint of spreading mistletoe, but they deform and/or lead to mortality of small trees and failure of large trees.

3. Creation of Buffer Strips

Objective: To limit or stop the spread of dwarf mistletoe into a treated area from adjacent infested areas.

Guidelines: Use host-free strips to prevent mistletoe from re-entering the control area or, when the parasite is not eliminated, from leaving the site. Buffer strips should be at least as wide as the height of the highest mistletoe plants in the adjacent infested stand. Examples of existing buffers include meadows, roads, rivers, clearings, and aggregations or plantings of non-host trees. Construction of new roads, structures, or campsites can also be used to create buffer zones and eliminate pockets of heavily infected trees.

4. Branch Pruning/Eradication

Objective: To reduce or eliminate dwarf mistletoe seed in the stand and improve tree vigor.

Guidelines: For trees with DMR of 3 or less, or a rating of 4 and no mistletoe in the upper one-third of the crown, prune all lower branches, both healthy and diseased, at the bole up to and including the second whorl of branches above the highest visible mistletoe infection. Experience has shown that despite removing branches up through the highest infection or even one more whorl, latent infections almost certainly appear in three to five years. Whenever possible, avoid removing more than 50% of a tree's live crown. Pruning of all infected branches in infected trees in an attempt to eradicate this pest requires careful adherence to these guidelines, and will have the greatest chance of success when used on isolated high-value trees or in areas of one acre or less where infection is light. Do not attempt eradication if the pruning will result in a tree with a crown of less than 30%, or if the tree will be exposed to continued infection from adjacent infected trees. It is difficult to completely

eliminate dwarf mistletoe from a tree without at least two treatments. Plan to reenter and retreat if needed at least twice after the first entry.

Indirect Suppression Methods

1. Thinning

Objective: To improve stand growth and tree vigor.

Rationale: Despite direct dwarf mistletoe treatment, the benefits from reducing or eliminating infection may be offset by continuing competition for growing space in overcrowded stands. Even where mistletoe is absent, overstocking contributes to poor tree vigor and an unnecessarily high risk of death from bark beetle attack. Although privacy and esthetic requirements in campgrounds may prevent thinning to stocking levels optimum for timber-producing forests, some thinning may be necessary if campground stands are to maintain vigor and resistance to pest attack.

2. Favoring and Planting Non-Host Conifers and Hardwoods

Objective: To eventually replace infected trees with uninfected trees and to lessen future spread of dwarf mistletoe.

Rationale: Because western dwarf mistletoe (A. campylopodum) infects neither the hardwoods nor most of the conifers growing with susceptible ponderosa and Jeffrey pines, managers may favor these non-hosts so that they become a larger component of the campground stands. Selected individuals or small aggregations of these non-host species may be retained as buffers to movement of the parasite, or as eventual replacements for severely infected pines that cannot be removed during mistletoe treatment. Wherever there are pure stands of severely infected pines, planting of non-susceptible species may be the only way to ensure that new trees replace the pines that die or are removed. However, for plantings to survive in campgrounds, managers must be prepared to protect them with stakes, fencing, drip irrigation, a visitor information program, and other expensive treatments.

3. Rotation of Campground Usage

Objective: To provide long-term recovery of heavily infested areas.

Rationale: Successful mistletoe treatment and thinning are sometimes incompatible with campground management, and partial treatments are usually not biologically or economically sound. In such cases it may be advisable to close a campground so that treatment can be carried out properly and stands revegetated where necessary. Although closing part or all of a campground for 10 to 15 years may seem impossible in the short run, the advantages that accrue from healthier stands and a greater mix of tree species and ages may offset the temporary loss of the site. Severely infested campground stands will continue to decline until the campgrounds

finally must be closed; it may be cheaper to revitalize the stands while possible, rather than wait until the old grounds must be closed and completely regenerated. And, when campgrounds must be closed because of a shortage of money and personnel, managers could select for closure those sites where mistletoe treatment and stand rejuvenation are most needed.

INTEGRATED PEST MANAGEMENT

Dwarf mistletoe is often only part of a larger set of stand, site, and pest factors. Before treatment, each campground should be evaluated thoroughly to ensure that all pests are considered in the management alternative(s) selected. For example, treatment of dwarf mistletoe-infected pines might not be economical in an annosus (Heterobasidion annosum) root disease center, due to the high probability of tree mortality. However, if such trees still appear healthy five years after the project is concluded, treatment would then be justified to limit dwarf mistletoe spread from the trees.

When tree removal and pruning does take place, treat all freshly cut stump surfaces with borax to prevent the establishment of H. annosum. Also treat green slash generated by pruning or tree removal to reduce the risk of pine engraver beetle (Ips spp.) buildup. Slash created in the spring or early summer should be either lopped and scattered, piled and burned while green, chipped, or removed to a location lacking susceptible hosts.

REFERENCES

Hawksworth, F.G. 1961. Dwarf mistletoe of ponderosa pine in the southwest. USDA Technical Bulletin No. 1246. 112 pp.

Hawksworth, F.G. 1977. The 6-class dwarf mistletoe rating system. USDA Forest Service, Gen. Tech. Rep. RM-48. 7p.

Lightle, P.C. and Hawksworth, F.G. 1973. Control of dwarf mistletoe in a heavily used ponderosa pine recreation forest: Grand Canyon, Arizona. USDA--Forest Service, Res. Pap. RM-106. 22 pp.

Scharpf, R.F., Smith, R.S., and Vogler, D. 1988. Management of western dwarf mistletoe in ponderosa and Jeffrey pines in forest recreation areas. USDA-Forest Service, Gen. Tech. Rpt. PSW-103. 11 pp.

Vogler, D.R. and Scharpf, R.F. 1981. Dwarf mistletoe-related mortality of ponderosa and Jeffrey pines at five campgrounds in California and Nevada. USDA--Forest Service, Pacific Southwest Region, For. Pest Mgmt. Rpt. No. 8-18. 22 pp.

USDA - Forest Service

FOREST PEST MANAGEMENT PROJECT PROPOSAL

(Ref: FSM 3400, Report FS-3400-E)

PART I – REQUESTING OFFICE USE ONLY

1. Region/Area	2. State	3. Fiscal Year	4. Causal Agent	5. Group	6. Landownership *(x appropriate box)* ☐ National Forest ☐ Other Federal

7. Type of Project *(x appropriate box)* ☐ Prevention ☐ Suppression	8. Status of Project *(x appropriate box)* ☐ New Project ☐ Continuing Project	9. Host Protected

10. Prevention/Suppression Method	11. Pesticide	12. Application Rate

13. Program Activities (a)	First Year Targets and Costs: Units of Work (b)	Unit Cost (c)	Total Planned Cost (d)	Funds Needed in Subsequent Years: FY: Estimated Cost (e)	FY: Estimated Cost (f)
(1) Pretreatment Survey (Acres)					
(2) Treatment (Acres)					
(3) Volume Treated (MBF)					
(4) Volume Removed (MBF)					
(5) Volume Protected (MBF)					
(6) Post-Treatment Evaluation (Acres)					
(7) Environmental Monitoring (Acres)					
(8) Other (Identify)					
(9) Subtotal					
(10) Indirect and service charges (Field) Percent of Subtotal (%)					
(11) Total Field Costs					

14. Proposed By *(Signature)*	15. Title	16. Date

PART II – REGION OR AREA USE ONLY

17. Region/Area Indirect and Service Charges Percent of Total Field Costs (%)					
18. Total Project Costs					

19. Approved By *(Signature)*	20. Title	21. Project Number	22. Date

PART III – WASHINGTON OFFICE USE ONLY

23. Project Action *(x appropriate box)* ☐ Approved ☐ Disapproved	24. Total Funds Allocated			

25. Approved/Disapproved By *(Signature)*	26. Title	27. Date

28. Remarks

INSTRUCTIONS: (Reference FSM (3400) Use this form only for projects on National Forest System and other Federal lands.

1. Region/Area

2. State

3. Fiscal Year

4. Causal Agent - Name the insect or disease involved.

5. Group - Indicate insect or disease group into which the causal agent falls. Groups are bark beetle (BB), defoliator (DEF), other insects (OI), dwarf mistletoe (DM), oak wilt (OW), other disease (OD).

6. Landownership

7. Type of Project

8. Status of Project

9. Host Protected - Name tree species affected.

10. Prevention/Suppression Method - Specify method to be used.

11. Pesticide - Include trade names of pesticides to be used.

12. Application Rate - If pesticide usage is involved, specify the dosage rate in pounds of active ingredient per unit treated.

13. Program Activities

14. Proposed By - Signature of person initiating the proposal.

15. Title

16. Date

17. Region/Area Indirect and Service Charges - Enter percent of field total cost from block 13(a)(11) and enter the amount imposed against the project at the Regional or Area office level.

18. Total Project Costs - Enter the sum of blocks 13(a)(11) and 15.

19. Approved By - Project proposal must be approved and dated by the Regional Office or Area Office or by their designated representative prior to submission to the Washington Office.

20. Title

21. Project Number

22. Date

23. Project Action

24. Total Funds Allocated

25. Approved/Disapproved By

26. Title

27. Date

28. Remarks